

PATENT SPECIFICATION



Application Date: June 26, 1924. No. 15,410/24.

232,077

Complete Accepted: April 16, 1925.

COMPLETE SPECIFICATION.

Improved Manufacture of Glue or the like.

I, Dr. HEINRICH BECHHOLD, citizen of Germany, of Niederräderlandstrasse 26, Frankfurt, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the manufacture of glue and the like. According to the invention glue and gelatin can be improved by the ultrafiltration of solutions of these substances. The term "ultrafiltration" is used to describe the operation of a filter, which is permeable to water, but is impermeable to colloids. In this way it is possible to remove with the water constituents (crystalloids and semicolloids) which are soluble therein and which are undesirable in glue and gelatin. For example, a glue liquor made from boiled bones or ossein or a solution of concentrated or dry glue or gelatin, can be subjected to ultrafiltration on a filter, for instance a membrane filter, under a suitable pressure produced either by pressure on one side of the filter or by a vacuum on the other side of the filter.

It is advantageous during ultrafiltration to maintain a temperature at which the glue or the gelatin does not gelatinise. Precautions also should be taken to prevent the formation of a layer of concentrated glue or gelatin on the surface of the ultrafilter, for instance by keeping the solution in movement by stirring, or by filtering from below to above. It may be desirable to remove vapours, which are developed during the ultrafiltration, for instance by suction.

The material can be subjected to ultrafiltration more than once, and although there is a marked improvement in the product after one operation, it is necessary to repeat the operation several times (the colloid being diluted with water) in

order to obtain a high degree of purity. It has been found to be advantageous to filter the ultrafiltered mass through an ordinary filter. For instance in some cases, after the dilution of the colloid residue by water, flocculent matter appears. This can be removed by ordinary filters. The filtration through ordinary filters can be performed between several repeated ultrafiltrations or can follow the final ultrafiltration.

The process is rendered more efficient by exposing the solution to the action of an electric current during ultrafiltration. One electrode touches the ultrafilter, or the porous vessel bearing the ultrafilter, on the side which is limited by air. The other electrode may be immersed in the solution of glue or gelatin. Indeed it has proved to be better to separate this second electrode from the glue or gelatin solution by a diaphragm. This diaphragm may also be an ultrafilter. In this case the glue or gelatin solution touches two ultrafilters, which are both directly or indirectly limited on one side by air. In this case the water with the contaminating constituents is sucked from the cell with the glue- or the gelatin-solution in the direction of both electrodes, while the electric current is working upon the glue or gelatin-solution. But it is not necessary to carry out the matter in this way. The second electrode, for instance, may also be immersed into a cell, filled with water or a watery solution, separated from the glue- or gelatin-solution by an ordinary diaphragm.

The electrodes may be the usual ones or they may be formed as a porous metallic cover on the ultrafilter or on the porous vessel formed as an ultrafilter or on the diaphragm.

The action of the electric current upon the glue- or gelatin-solution may take

[Price 1/-]

Price 25/-

Price 75/-

place before, during or after the ultrafiltration.

The success of the process depends on the quantity of H or OH-ions in the solution. During the purification of the solution the reaction should be as neutral as possible. While the electric current is working, alkali is formed on the cathode and acid on the anode. At the same time there is a disturbance of the neutrality on both sides of the ultrafilter or the diaphragm, independent of the products of the electrolysis. In consequence of this the glue or gelatin-solution becomes more acid or alkaline than is good for the process, this may partly be counteracted by regulating the ultrafiltration. But this is not always sufficient, so that it is recommended in certain cases that the solution in question is brought to a standard of H or OH-ions most suitable for the process by substances which bind acids or alkali. In a given case such substances may be present as solid bottom bodies. This bottom body is a solid substance in solution, which has the tendency to maintain the state of the system. For example: a solution of sulphate of sodium may be saturated at a certain temperature. If the temperature rises, the solution is no more saturated, but if there was a bottom body of solid sulphate of sodium present in the saturated solution, the solution keeps up its saturation, even if the temperature is raised. Another example: a solution becoming acid in a process may be kept neutral if there is present a bottom body of carbonate of calcium, this latter being dissolved in the same measure as acid is formed.

It is known that contaminating substances to be separated from glue pass through the diaphragms by osmosis or electro-osmosis with the chambers in which are fixed the electrodes. The water in the chambers has to be replaced from time to time or continually by fresh water or a fresh solution. Otherwise the contaminating substances would return to the chamber containing the material under treatment. This is true of the known arrangements in which both sides of a diaphragm are limited by liquids.

According to the present invention the ultrafilter is always limited on one side by the solution to be filtered and on the other side by air. The products of the electric transfer and the electrolysis are removed by hydrostatic or other pressure as is usual in filtration. No dilution or recontamination of the glue or gelatin is possible from the side of the ultrafilter.

EXAMPLE 1.

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A 5% solution of a bone glue of inferior quality was filtered through an ultrafilter, prepared by coagulation of a 4% collodion solution in acetic acid, at a temperature of about 60—70° C. The residue, which had a concentration of 28%, coagulated at the temperature of the room and was of a quality superior to that of the original glue. The ultrafiltrate contained 1.67% of undesirable substances.

EXAMPLE 2.

A 5% solution of bone glue was brought by ultrafiltration to a concentration of 25%. The warm glue-solution was then diluted by water to a concentration of 5%. The material became flocculent and the flocculent matter was removed by an ordinary filter. The filtrate was ultrafiltered once more. The glue improved by ultrafiltration had a higher viscosity and a better adhesive power than the original material. The ash of the original glue was 5.8%; the improved glue had only 1.5% of ash.

EXAMPLE 3.

A 2% solution of gelatin was treated on an ultrafilter, prepared in the same way as that in Example 1, under the action of an electric current. The porous vessel upon which the ultrafilter-membrane was expanded had on the side of the filtrate a porous metallic cover serving as a cathode. The anode was in a porous cell, filled with water, and was dipped into the gelatin solution. While the original gelatin solution had a whitish turbidity, the improved gelatin was transparent and clear like water. The original material contained 1.9% of ash; in the improved gelatin the ash had so diminished that it was not possible to measure it by weight.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A process of improving glue and gelatin by ultrafiltration of solutions of the material.

2. A process as claimed in Claim 1 characterised by the repeated ultrafiltration of glue or gelatin solution, the residue being diluted between each ultrafiltration.

3. A process as claimed in Claim 1 or in Claim 2, characterised by passing an electric current between an electrode on the side of the filtrate and another electrode in the solution to be filtered.

4. A process as claimed in Claim 3 in which the electrode in the solution to be filtered is separated from the glue or gelatin-solution by a diaphragm. 15
- 5 5. A process as claimed in Claim 4, in which the electrode in the solution to be filtered is separated from the glue- or gelatin-solution by a porous vessel forming an ultrafilter. 20
- 10 6. A process as claimed in Claims 1—5 the characteristic of which is bringing the H or the OH-ion-concentration of the solution to be treated to a proper degree for ultrafiltration or electro-ultrafiltration by proper substances. 25
7. The process of treating glue or the like substantially as described.
8. Glue or the like when treated by the process claimed in any of the preceding claims. 20

Dated this 26th day of June, 1924.

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